

IN THE DRAWINGS:

Please enter the attached corrected drawings Figs. 13A-17, in which the legend of "Prior Art" is being added in each figure, to replace Figs. 13A-17 as originally filed. A Letter to Draftsperson is also submitted herewith.

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Official Action dated February 7, 2005. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 1-2, 4-8 and 10 are under consideration in this application. Claims 3, 9 and 11 are being cancelled without prejudice or disclaimer. Claims 1, 7 and 10 are being amended, as set forth in the above marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim applicants' invention.

Additional Amendments

The claims and the drawings are being amended to correct formal errors and/or to better disclose or describe the features of the present invention as claimed. All the amendments to the claims and the drawings are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formality Rejections

Figs. 13A-17 were objected to due to the drawings not being labeled as "Prior Art", and the Examiner has requested correction thereof. As indicated, the drawings have been amended as required by the Examiner. Accordingly, the withdrawal of the outstanding informality rejection is in order, and is therefore respectfully solicited.

Prior Art Rejection

Under 35 U.S.C. 103(a), (1) Claims 1-5 and 10-11 were rejected as being unpatentable over the prior art described on pages 1-3 of the specification and Figures 13-17 (hereinafter "AAPA"), in view of U.S. Pat. No. 6,657,813 to Nishida et al. (hereinafter "Nishida"), and further in view of U.S. Pat. No. 5,467,330 to Ishida et al. (hereinafter

“Ishida”); (2) Claim 6 was rejected as being unpatentable over AAPA in view of Nishida, further in view of Ishida, and still further in view of U.S. Pat. No. 6,775,099 to Kuroda et al. (hereinafter “Kuroda”); and (3) Claims 7-9 were rejected as being unpatentable over AAPA in view of Ishida. The prior art references of Nishida et al. (6,657,813), Igarashi et al. (6,728,051), Fang et al. (6,778,481), Malone Sr. (6,583,943), Oka et al. (4,160,236) and Nakagawa et al. (5,986,592) were cited as being pertinent to the present application. The above rejections have been carefully considered, but are most respectfully traversed in view of the newly submitted claims, as more fully discussed below.

The magnetic recording apparatus of the invention (for example, the embodiment depicted in Figs. 4-6) as recited in claim 1, comprises: a magnetic recording medium 11 having a soft magnetic underlayer 22 and a magnetic recording layer 24; a magnetic head 13 including a recording head; a signal processing circuit for converting user data into a recording data sequence 45 on a sector block 53 by sector block basis; and a current driver 46 for converting the recording data sequence 45 into a recording current 47 that is applied to the recording head. The signal processing circuit adds at the end of the recording data sequence 45 for each sector block 53 a repetition pattern 56 of a minimum bit length T for the particular block 53, and the repetition pattern 56 includes more than two (>2) of the repeated minimum bit length (e.g., 5 repetitions in Figs. 10-11).

The invention as recited in claim 7 is directed to the magnetic recording medium 11 recited in claim 1.

The invention as recited in claim 10 is directed to a method of recording information on a magnetic recording medium 11 comprising a soft magnetic underlayer 22 and a magnetic recording layer 23 using a recording head, the method comprising the steps of: converting inputted user data into a recording data sequence 45; adding a repetition pattern 56 of a minimum bit length T at the end of the recording data sequence 45, and the repetition pattern 56 including more than two (>2) of the repeated minimum bit length; converting the recording data sequence 45 to which the repetition pattern 56 of the minimum bit length T is added at the end thereof into a recording current 47; and driving the recording head with the recording current 47.

The present invention relates to magnetic recording, and it is an object thereof to resolve the problem of post-recording erasure resulting from a single pole type recording head (SPT head). The post-recording erasure occurs when the track width of the SPT head is narrowed to achieve higher recording density for a double layer perpendicular magnetic

recording medium. As shown in Fig. 13(b), residual magnetization remains at the tip of the main magnetic pole even when a recording current is set to zero. Recorded data is erased due to magnetic flux leaking from the tip of the main magnetic pole. According to the invention, by adding at the end of recording data sequence for each sector block a repetition pattern of a minimum bit length for the particular block, residual magnetization can be reduced. Therefore, as shown in Fig. 8, the probability of occurrence of the post-recording erasure is substantially reduced.

Applicants respectfully submit that none of the cited prior art references teaches or suggests such “a signal processing circuit adds at the end of the recording data sequence 45 for each sector block 53 a repetition pattern 56 (of more than two) of a minimum bit length for the particular block 53 (claim 1)” or such “a step of adding a repetition pattern 56 (of more than two) of a minimum bit length T at the end of the recording data sequence 45 (claim 10)” according to the invention.

In contrast, Ishida relates to an optical disc of a phase change rewriting type and has an object to improve repetitive frequency by controlling the fluctuation of a heating level for laser and reducing a thermal stress applied to a media through devised patters for a fixed pattern portion. Prior to Ishida, if the upper limit and the lower limit of the run length of zeros (the length by which zeros continue) of recording codes are fixed, the pattern of “minimum-maximum-minimum-minimum” (2-7-2-2, for example in Fig. 4(i)) is used, in which the minimum and the maximum are adjacent and the minimums are adjacent. On the other hand, Ishida uses a pattern of “maximum-minimum-maximum” (7-4-7, for example in Fig. 4(b)) such that the minimum and the maximum are not adjacent and the minimums are not adjacent. This resolves conventional problems that zero levels are increased since the minimum portion has high temperature because of a long period when laser is on, while the maximum portion has low temperature because of a long period when laser is off.

However, the invention adds “a repetition pattern (of more than two) of a minimum bit length T” to the end of a sector corresponds to a pattern of “minimum-minimum-minimum ...” (e.g., 2-2-2-... or 4-4-4-...) in terms of Ishida. As such, Ishida’s teaching of no adjacent minimums 7-4-7 teaches away from the invention. As to the prior art teaching of 2-7-2-2 described in Ishida, it includes only two (=2), rather than more than two (>2), of the repeated minimum bit length.

In addition, Applicants contend that one skilled in the art would not be motivated to apply the FMA patterns of Ishida or the prior art described therein on an optical disk to a

magnetic disk of the invention, since the intended proposes of the FMA patterns: to resolve the thermal problems due to *laser*, do not exist in a magnetic disk.

Even more, the fixed pattern FMA of Ishida or the prior art described therein are recorded at the **HEAD** of the data sign for synchronization (col. 5, line 66-67), rather than at the **END** of a sector block to reduce residual magnetization.

Applicants contend that the mere fact that one of skill in the art might rearrange the fixed patterns FMA of the prior art described in Ishida to meet the terms of the claims is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for one skilled in the art to provide the unexpected properties, such as reduce residual magnetization in magnetic disks, without the benefit of appellant's specification, to make the necessary changes in the reference device. *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). MPEP§2144.04 VI C. Ishida and the prior art described therein were intended for optical disks which do not have residual magnetization.

Applicants further contend that the combination of references AAPA, Nishida, Ishida, Kuroda as used by the Examiner merely consists of selecting bits and pieces from each reference, and then combining those bits and pieces using knowledge or hindsight gleaned from the disclosure of the present invention as a guide to support the combination. The well established rule of law is that each prior art reference must be evaluated as an entirety, and that all of the prior art must be considered as a whole," *Panduit Corp. v. Dennison Mfg. Co.*, 227 USPQ 337, 344 (Fed. Cir. 1985). See *Para-Ordinance Mfg, Inc. v. SGS Importers Intl., Inc.*, 73 F.3d 1085, 37 USPQ2d 1237 (Fed. Cir. 1995) ("Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor.").

Applicants contend that AAPA, Nishida, Ishida, Kuroda and their combinations fail to teach or disclose each and every feature of the present invention as disclosed in independent claims 1, 7 and 10. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

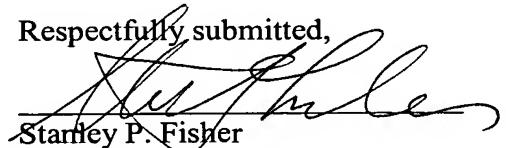
Conclusion

In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art reference upon which the rejections in the Office Action rely, Applicants respectfully contend that the prior art references cannot

anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

Respectfully submitted,


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